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(54) Abstract Title
Intruder deterring security device

(57) A security device comprises a strobe light in communication with a sensor to detect the motion or body heat of a human intruder or potential attacker. The strobe light is actuated on detection of the human by the sensor, and provides a disorientating effect allowing for the accosting or capture of the attacker or intruder, or may dissuade the intruder from proceeding further. A number of such devices may be connected together, and each such device may optionally be capable of receiving and transmitting strobe light flash frequency signals and synchronising signals such that the strobe lights of all the interconnected devices flash at the same frequency and synchronously. The devices are thus capable of operating either as "masters" or as "slaves".

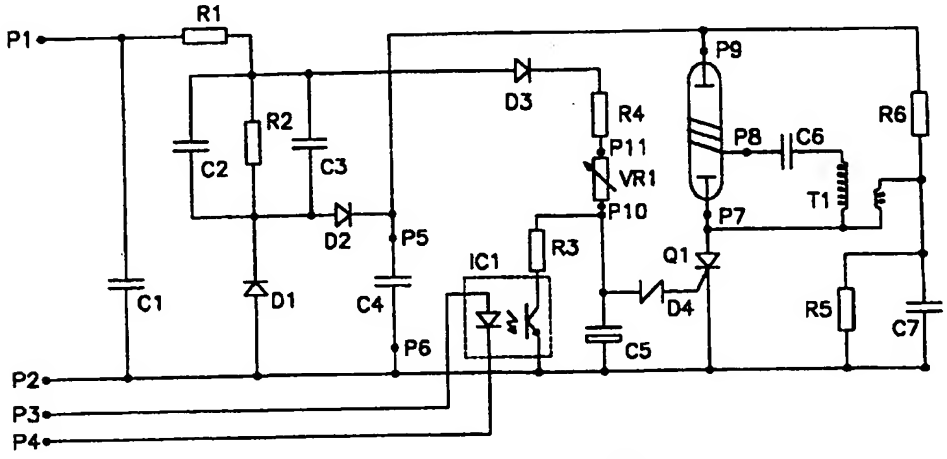

FIG. 3

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

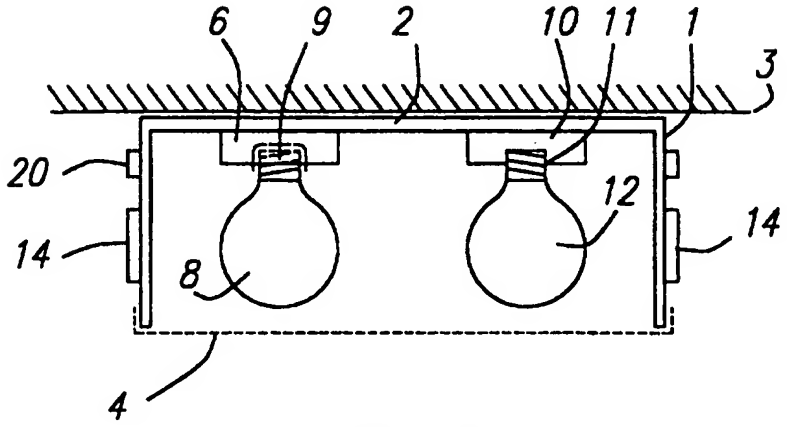

FIG. 1

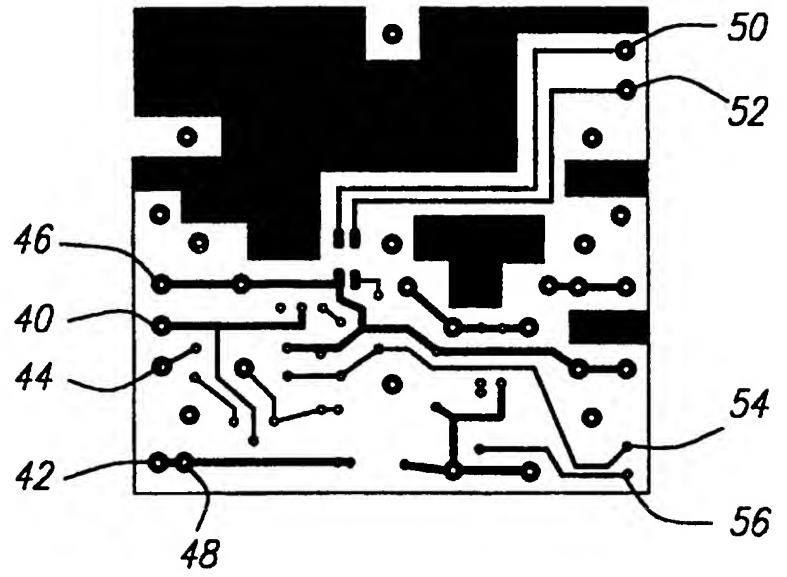

FIG. 2

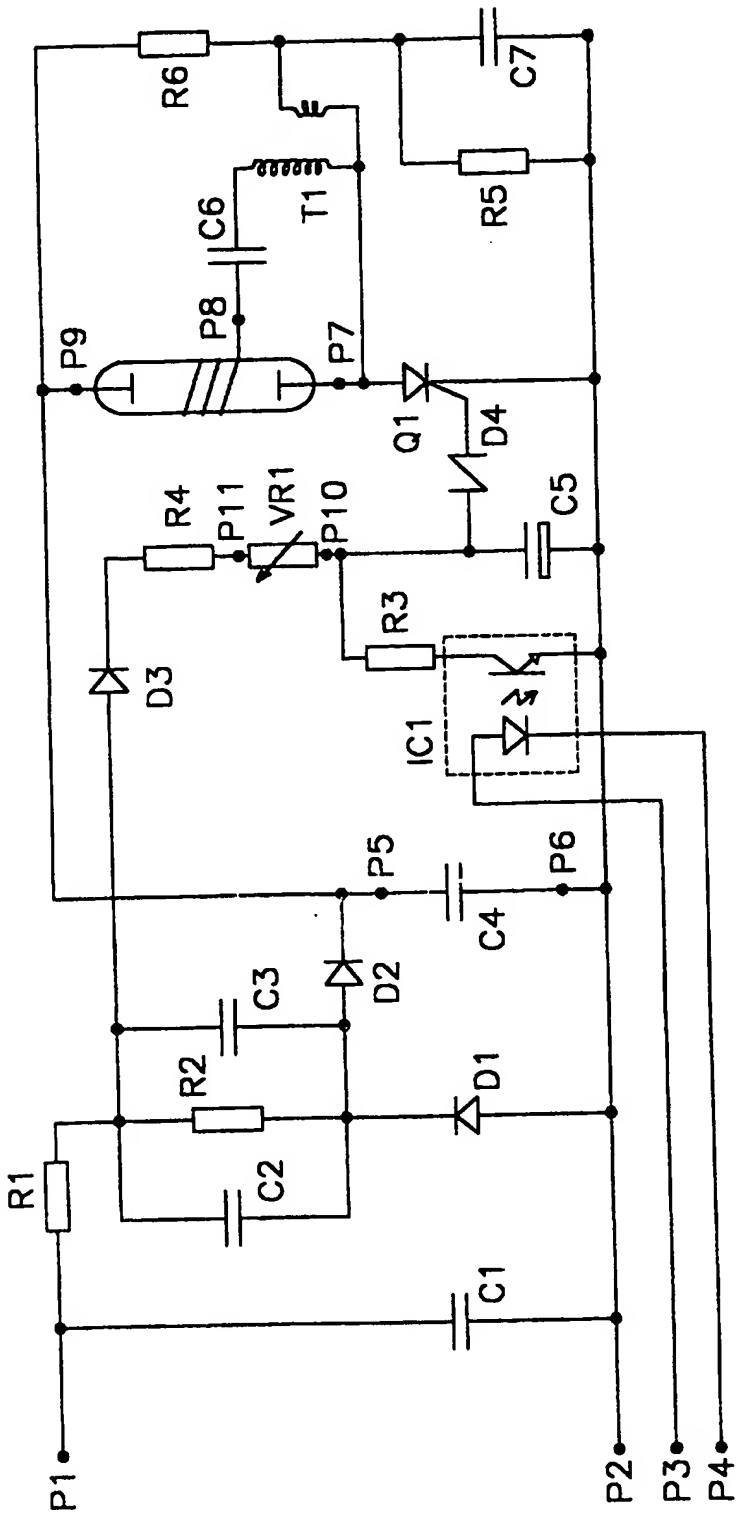
R6
C7
T1
C6
R5
P8
P9
P7
Q1
D4
R4
P11
VR1
P10
C5
R3
D3
IC1
P5
P6
C4
C3
D2
R2
D1
R1
C2
C1
P1
P2
P3
P4

FIG. 3

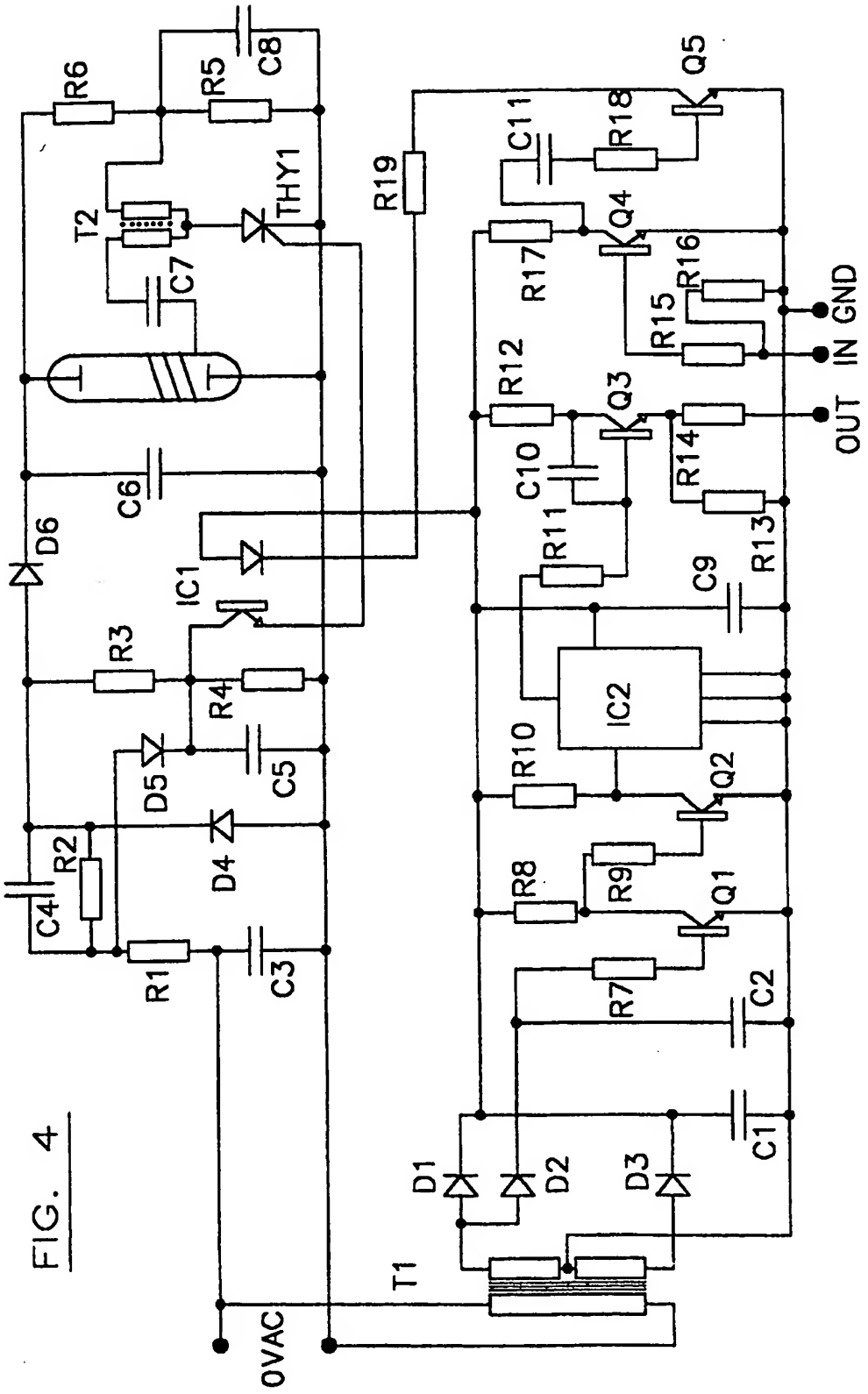
R6
R5
C8
T2
THY1
C7
C6
D6
IC1
R3
R4
D5
C5
R2
C4
D4
R1
C3
0VAC
R19
C11
R18
Q5
Q4
R17
R16
R15
R12
Q3
R14
C10
R11
R13
C9
IC2
R10
Q2
R8
R9
Q1
R7
C2
C1
D1
D2
D3
T1
IN GND
OUT

FIG. 4

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Improved Security System

This invention relates to a security system adapted to both draw attention to an intruder and/or attacker or the like and to disorientate this person.

There are a substantial number of intruder and/or security alarms available on the market. Usually each alarm system comprises a sensor or detector, which is usually adapted to detect a change its surroundings. The detector may, for example, detect a change in movement, temperature, sound or may comprise a video camera or the like. Such detectors are usually adapted to automatically trigger an alarm or the like. Typically alarms tend to be in the form of lights and /or audible sirens both of which are adapted to attract the attention of people in the vicinity of where the alarm is triggered.

One type of system, which is presently available, is a security lighting unit fitted to the exterior of buildings. These generally comprise a movement or the like sensor, which upon sensing a movement, actuates a light to be switched on for a predetermined period. Whilst such units may bring an intruder to the attention to of people, it does not hinder the movement of said intruder, indeed whilst the light is switched on the intruder may well be able to see what he or she is doing much better than if the light were not used.

Personal alarms are also becoming increasingly popular in particular for people who have to travel alone at night. These alarms are usually hand operated and might produce a loud siren to attract the attention of passers-by or a debilitating fluid such as CS gas. In the case of the latter a jet of fluid is projected towards the attacker's eyes and causes short-term blindness, which is sufficient to enable escape.

British policemen, do not usually carry firearms during normal duties and have to rely on batons as means of protection. If a baton is used against an offender, physical pain and damage may be caused to the offender.

Hence a large number of alarm, security and/or defence systems available today are adapted to either merely draw the attention of the police, security guards or passers-by to an offence or attack in progress

The present invention seeks to provide a security system which both attracts the attention of the public to an offence or attack which is taking place and also disorientates the offender with a view to enable an escape of the person being attacked or the capture of the offender.

According to the present invention there is provided a security device comprising a sensor mechanism and a strobe light unit in communication therewith adapted to emit either fixed or variable speed light flashes on sensor actuation.

The security device of the present invention is preferably adapted to fixed to a wall or the like out of the reach of an intruder.

The device may comprise any appropriate sensor adaptable to initiate the operation of the strobe unit. In the case of a movement sensor this may, for example, be heat, microwave, ultrasonic activated but any other means of detection may be utilised dependent on installation surroundings.

The sensor will preferably be adapted to have a variable sensitivity and may incorporate light emitting diodes and where required variable sound output.

The device may comprise a self-contained power supply or utilise an external power supply. In the case of the former the device may be battery- or solar-powered or may operate under any other appropriate power supply.

In the case where a device of the present invention is attached to a wall or building or the like for night time operation the unit may contain a night and day switch such that the device is switched off during the day but is automatically activated at night time. Upon actuation the device is adapted to emit stroboscopic light when movement or other determinable characteristic of a human or animal (such as body heat) is sensed.

The flash frequency of the strobe light may be fixed or variable, and any appropriately coloured bulb(s) may be used.

A standard light may also be contained in the device. This light may be switched on manually, automatically, for example, after the strobe light has been operating for a predetermined time period, or may be actuated by way of a remote control unit by a security guard or the like.

The unit of the present invention may form part of or be contained in a camera unit such that video film or still photographs may be taken by the camera to aid identification of an intruder or the like.

In one specific embodiment the unit may be mounted on a wall, roof or pole or the like, preferably out of the reach of a person such that an intruder is unlikely to be able to deactivate the light device.

One of the problems with the movement activated lights, presently available, is that they are easily broken. This may occur in several ways but in particular is because of the weakness of the glass in which the bulb is encased and also of the bulb itself. A simple impact from a stick or a stone may be sufficient to fracture both the glass and the bulb and deactivate the system. The present device is far less likely to be broken in this way, both because of the strategic mounting of the lights according to the invention, and because of a grill which preferably restricts access to the glass encasement and bulb therewithin. Alternatively the strobe bulb may be protected by toughened glass or bullet-proof glass.

It is to be further noted that currently available security lights are permanently lit once actuated and thus have high power consumption and are therefore costly to use over an extended period of time.

One significant advantage over the prior art is that strobes of the present invention require significantly less power and therefore are significantly cheaper than systems which are presently available.

The utilisation of the strobe light, preferably in combination with a sound unit ensures that not only is an intruder disorientated but the sound emitted will attract the attention of other persons who may be able to catch or chase the intruder.

In one embodiment there will be provided a time delay means whereby the strobe light is activated a predetermined time period after the intruder is first detected by the sensor. This embodiment will enable the movement sensor to trigger a remote warning system to advise a Security Guard or police officer of an intruder prior to alerting the intruder to the system. Such a time delay prior to

initiating the strobe light being designed to improve the chances of an intruder being caught.

In the case where a plurality of devices of the present invention are utilised about the same building, different coloured strobe lights might be used in different areas. The colour difference would assist Security Guards and the like in determining where the intruder is situated at any one time and if different coloured lights are set off subsequent to each other a guard will be able to determine the direction being taken by an intruder. Similarly if each different device activates a warning signal at a remote station such as a guardhouse a person may follow the progress of an intruder in this way. Alternatively or in addition to the latter strobes of the present invention may be adapted to have variable flash frequencies for a similar reason.

The unit may be housed in shock resistant or armoured plate to provide protection to the strobe light bulb and power pack.

Other disorientating means may be adapted to operate in conjunction with the device of the present invention, for example smoke machines or means for emitting a disabling fluid such as CS gas might be adapted to be utilised in combination with the strobe light of the present invention.

The unit may alternatively be adapted for installation in or on high risk transport such as armoured vans and the like, such that the strobe light might be used as a deterrent as opposed to a defensive article.

In one embodiment, a device of the present invention may be adapted for use on a riot shield or the like such that an attacker may

be at least momentarily prevented from attacking the person holding a shield.

In a still further embodiment the strobe light of the present invention may be utilised inside a truncheon such that the truncheon would be pointed at the suspect or intruder or the like and manually activated to issue a disorientating light towards the suspect or intruder. Such a device might assist the police in the arrest of a person due to the disorientating effect thereon.

In a modified aspect of the invention, it is preferable that a plurality of the strobe lights according to the invention are capable of being interconnected, one of said lights communicating with the remainder to dictate their strobe flash frequency such that the flash frequency of all the interconnected strobes is identical, and their flashes are synchronised. This "master/slave" operation of a plurality of lights is preferable in installations over a large area, which therefore require a plurality of lights to be fitted.

It is further preferable that the flash frequency of the said one strobe light is capable of being varied during operation of the strobe, the flash frequency of the remaining interconnected strobes varying according to that of the said one strobe light. The enhances the disorientating effect of the security light according to the invention.

Specific embodiments of the present invention will now be described by way of example with reference to the accompanying Figures, wherein:

Figure 1 shows a strobe light according to the invention;

Figure 2 shows a particular printed circuit board (PCB) layout with tracks and lands for driving the strobe light of Figure 1;

Figure 3 shows a circuit diagram showing the components and their connection to be implemented on the PCB of Figure 2;

Figure 4 shows an extended circuit diagram for master/slave control of strobe lights according to a modified aspect of the invention.

In a first embodiment of the invention, a device 1 comprises an outer casing 2 fixed to an external wall 3 of a building. The device comprises a day/night detector 20 which is light /dark activated. Alternatively a timer unit (not shown) may be provided so that an operator may predetermine the period of time when the device is active may be utilised and preferably would be set remotely in order to ensure that an intruder can not disarm the device. Sensors 14 detect movement of an intruder within a predetermined distance of the unit. In the present case sensors 14 form an integral part of the device 1 but may be remote from unit 1 if so required. Sensors 14 may operate using EM radiation.

The front of device 1 is protected by grill 4 in order to allow light emitted from bulbs in unit 1 to pass through but to prevent foreign bodies being used to break the bulbs.

A strobe light 8 having a screw fixing 9 is powered through a cup 6 which receives the fixing 9. The present embodiment also utilises a second light 12 which is a standard light having a screw fixing 11 received by a cup 10 to which power is also supplied.

Sensors 14 are adapted to trigger a switch not shown which in turn actuates strobe light 8 either instantaneously or after a predetermined period of time. The switch may be utilised to

activate one or more additional devices in particular an audible alarm (not shown) or the like. Such additional devices are only optional and where the device of the present invention is utilised for the outside of a house merely the use of the strobe light 8 with or without standard light 12 and/or an audible alarm might be considered sufficient.

In a particular embodiment the power is at least partially provided by solar energy.

In use when a sensor 14 detects movement of an offender it triggers the switch (not shown) which in turn actuates the power source and strobe light 8. Strobe light 8 subsequently emits strobe lighting directed into the path of the intruder detected by sensor 14 and thereby disorientates the offender. The strobe lighting from light 8 may be operated at a fixed or variable flash frequency for a predetermined period of time for example 5 minutes. After which time it will be automatically switched off and standard light 12 may be switched on automatically. Alternatively standard light 12 may be activated by a guard or a person in the house upon arrival in order to accost the offender. As a further alternative when the system is utilised for a house, the standard light 12 may be adapted to be switched on when movement is detected if for example visitors are expected. This would assist the visitors to determine the pathway to be taken and would ensure that bone fide guests are not shocked or surprised by actuation of strobe light 8. Hence the night/day automatic switch may be overridden in such circumstances.

However, when the unit is on the side of a factory or bank or in a security van or corridor in a building or the like, further devices might be additionally actuated by the sensor. These may include, for example, a camera unit, smoke machine or a unit for emitting a debilitating substance such as CS gas or the like. In relation to the

latter two alternatives, particularly when a camera has been previously actuated, it is considered that the camera and alarms may bring the intruder to the attention of a guard or the like who could then remotely actuate a smoke machine and/or debilitating substance once ensuring that the movement detected is that of an intruder.

Figure 2 shows a Printed Circuit Board (PCB) driver unit for connection to a strobe tube (not shown) and a remote control unit. The cathode and anode of the strobe tube are connected to terminals 40, 42 respectively, with the trigger for the tube being connected at 44. An external capacitor is additionally connected across the strobe tube at 46, 48, which are the negative and positive terminals respectively.

A remote control circuit may be connected across positive and negative terminals 50, 52, and the PCB is supplied with 240V A.C. across terminals L, N which respectively represent live and neutral connections. A speed potentiometer (rated at 470k LOG, 350V d.c. proof) is preferably connected across the terminals 54, 56.

The following description is provided with reference to Figure 3 which shows the circuit diagram for the strobe tube driver circuit.

Incoming mains power of 220-240V a.c. is filtered via C1 and fed via a limiting resistor R1 to a peak rectifying voltage doubler circuit comprising C2, R2, C3, D1, D2, and C4.

The capacitor C4 requires to be of at least 650Vdc rating, high quality, low impedance construction, and capable of repeated rapid discharge at high currents.

The capacitor C3 requires to be of 400Vdc rating (in the present unit, two capacitors in parallel are used to achieve the required capacitance within the physical size constraints imposed by the application housing).

The resulting 650 volt supply is fed to a 2 Joule strobe tube.

D3, R4, VR1, C5 and D4 form a relaxation oscillator providing firing pulses to a thyristor Q1. By taking the supply via R1 and D3, the peak voltage requirement of VR1 is kept down to 350 volts, rather than the convention of drawing from the high voltage supply, which would require a rating of 650 volts on VR1.

Thyristor Q1 is a 12 amp, 800 volt type, with 15mA gate current requirement.

T1 is a purpose wound strobe tube firing transformer, the secondary of which is connected via a capacitor to the trigger electrode on the strobe tube, the primary is connected to potential divider R6 and R5, allowing a charge of around 200 volts to develop across C7.

When the thyristor Q1 is triggered into conduction, C7 is discharged through T1 primary, which produces around 4kV on the tube trigger electrode.

Since Q1 is already conducting, the strobe tube fires, and discharges C4.

Remote Control:

Remote control can be facilitated via opto-isolator IC1.

Failsafe operation is achieved by using the opto-isolator to turn the strobe unit OFF. Applying 12 volts VIA a 4K7 resistor to the remote terminals will stop the unit from firing.

Wiring Requirements:

Wiring to the tube must be done with due consideration to the high voltages and currents involved.

Mechanical Requirements:

Care must be taken to prevent short circuit of any part of the PCB to any mounting pillars/screws etc. to which the unit may be attached.

PARTS LIST:

R1	8R2 6 watt resistor
R2	1M5 1/2 watt resistor
R3	1K 1/4 watt resistor
R4	22K 1/4 watt resistor
R5	100 K 1/2 watt resistor
R6	200 K 1/2 watt resistor
C1	10n X2 275Vac capacitor
C2, C3	2u2 400 Vdc polyester capacitor
C4	8uf 440 Vac (650vdc) capacitor
C5	22u 50V electrolytic capacitor
C6	470p 2kV ceramic capacitor
C7	47n X2 275Vac capacitor
D1, D2, D3	IN4007 diode
D4	DB3 Diac
Q1	BT151-800R thyristor
VR1	470K LOG potentiometer 350Vdc rating

T1	Xenon Tube firing transformer
ICI	SFH618 Opto Isolator

Additionally required items are a Printed Circuit Board, Mounting Pillars, and Cables.

The following description is provided with exclusive reference to Figure 4, which shows a circuit diagram for an enhanced strobe tube driver circuit which is capable of operating as either a "master", dictating a strobe flash frequency to other strobe driver circuits connected thereto, or as a "slave" to which such a strobe flash frequency is dictated.

The unit circuitry is comprised of two parts, the strobe tube driver circuit, and a synchronous firing circuit.

1 – Strobe Tube Driver Circuit.

Incoming mains supply of 220-240Vac is filtered via XC3, and fed via a limiting resistor XR1 to a peak rectifying voltage doubler circuit comprising XD4, XD6, XC6 and XC4.

The charge across XC4 is bled away during "power off" by XR2, for safety considerations.

The capacitor XC6 requires to be of at least 650Vdc rating, high quality, low impedance construction, and capable of repeated rapid discharge at high currents.

The capacitor XC4 requires to be of at least 400Vdc rating.

The resulting 650 volt supply is fed to a 6 Joule (Ws) rating strobe tube.

XD5, XC5, XR3 and XR4 form a half-wave rectified, mains-derived power supply for opto-isolator XIC1, which drives the gate of thyristor XTHY1, as a result of incoming trigger signals from the synchronous firing circuit.

XR6, XR5 and XC8 form a synchronous voltage divider, providing around 200 volts which is discharged into XT2 when XTHY1 conducts.

XT2 secondary provides a high-voltage (2-6kV), low-current pulse via XC7 to the firing electrode of the strobe tube.

The conduction of the strobe tube discharges XC6, and lowers the voltage across XC8 prior to the next charging cycle.

2 – Synchronous Firing Circuit.

In order that the XFU1-98 circuit can be safely linked to other units, the synchronising and firing pulse circuits are driven from a low-voltage, fully isolated supply, and the outgoing firing pulses are opto-isolated from the directly connected strobe tube circuit.

XT1 provides via XD1, XD3 and XC1, a full-wave rectified 12-15 volt power supply. XD2, XC2, XR7, XQ1, XR8, XR9, XQ2 and XR10 from a 50 Hz pulse generator, synchronised to mains frequency. IC2 divides the 50Hz pulse train by 10, to give an accurate 5Hz repetition frequency, this being the recommended maximum for low-speed strobes as determined by Health & Safety Executive.

XR11, XQ3, XR13, XR12 and XR14 form an output buffer, capable of driving a 600 ohm line at about 5 volts amplitude, the rise time

of the output pulse is limited by XC10 in consideration of EMC reduction.

XR15, XR16, XC10, XR17, and XQ4 form a high impedance, bridging input, integrating amplifier, which facilitates many units being coupled across a single drive line.

XC11, XR189 and XQ5 form a differentiating amplifier which drives the Strobe Circuit opto-isolator with short pulses to minimise power dissipation.

Any unit may be configured for "stand-alone" operation by simply connecting the pulse "in" and "out" pins together.

A unit may be configured as a "master" unit, by connecting the "in" and "out" pins together, and also bringing out this point, together with a "gnd" connection to a suitable connector.

A unit may be configured as a "slave", by connecting a master unit's output to the "in" and "gnd" pins on the board.

"Stand-alone" units will all run synchronously with the mains, but not "phase-synchronous". Where units are configured as master and slaves, the system will be mains synchronous, and phase synchronous.

This allows a large system to be executed, as if the entire area were being illuminated by a single giant strobe.

CLAIMS

1. According to the present invention there is provided a security device comprising a sensing device and a strobe light unit in communication therewith adapted to emit either fixed or variable frequency light flashes on or a predetermined time after sensor actuation such that a human is disorientated by the strobe light.

2. A device according to claim 1 characterised in that the sensing device has a variable sensibility and optionally incorporates light emitting diodes and further optionally variable sound output.

3. A device according to any of the preceding claims characterised in that said device is further provided with a self-contained power supply.

4. A device according to claim 3 characterised in that the device is battery-powered.

5. A device according to claim 3 characterised in that the device is at least partially solar-powered.

6. A device according to any of the preceding claims characterised in that a night and day switch allows the device to be de-activated during daytime.

7. A device according to any of the preceding claims characterised in that the strobe light is provided with a bulb capable of producing a light other than white light.

8. A device according to any of the preceding claims characterised in that a non-stroboscopic light is provided in combination with the strobe light which may be switched on

manually or automatically after the strobe light has been operating for a predetermined time period.

9. A device according to claim 9 characterised in that the non-stroboscopic light is actuated by remote control.

10. A device according to any of the preceding claims characterised in that the sensor is also in communication with a camera unit such that video film or still photographs may be taken by the camera to aid identification of the human.

11. A device according to any of the preceding claims characterised in that a time delay means is provided whereby the strobe light is activated a predetermined time period after the human is first detected by the sensor.

12. A device according to any of the preceding claims characterised in that at the device is contained in impact resistant material.

13. A device according to any of the preceding claims characterised in that a grill is provided in front of the strobe light to enable light to pass through the grill but to prevent articles such as stones and rocks from reaching and breaking the bulb.

14. A device according to any of the preceding claims characterised in that the strobe light bulb is protected by or incorporates impact resistant glass.

15. A device according to any of the preceding claims characterised in that the sensor additionally communicates with a smoke machine.

16. A device according to any of the preceding claims characterised in that the sensor additionally communicates with means for emitting a disabling fluid.

17. A security device comprising a sensing device and a strobe light unit in communication therewith adapted to emit either fixed or variable frequency light flashes on or a predetermined time after sensor actuation such that a human is disorientated by the strobe light, further characterised by a strobe light driver circuit capable of receiving synchronising signals which dictate the particular time at which the strobe light flashes.

18. A security device according to claim 17 characterised in that the strobe light driver circuit is further capable of receiving flash frequency signals which dictate the flash frequency of the strobe light driven thereby.

19. A security device according to claim 17 characterised in that the strobe light driver circuit is capable of transmitting synchronising signals and/or strobe light flash frequency signals.

20. A security system comprising a plurality of interconnected security devices of the type according to any of the preceding claims characterised in that one of said devices communicates with the remainder to dictate their strobe light flash frequency such that the flash frequency of all the interconnected devices is identical at any particular time although the flash frequency may vary over time, and their flashes are synchronised.

21. A security system according to any of the preceding claims characterised in that the flash frequency dictated by the said one device is capable of being varied during operation of the device, the

flash frequency of the remaining interconnected devices varying according to that of the said one strobe light.

22. A security system according to claim 20 or 21 characterised in that on actuation of one of the plurality of interconnected devices, the remainder are automatically actuated.

23. A security system according to claim 20 or 21 characterised in that each one of the plurality of interconnected devices is independently actuated as the sensor associated therewith is actuated, such that as a human traverses an area where said devices are installed, further devices are actuated and the movement and thus the location of the human can be tracked.

The Patent Office

19

Application No: GB 9812134.6 **Examiner:** David Summerhayes
Claims searched: 1-23 **Date of search:** 7 September 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): G4N (NDAX)

Int Cl (Ed.6): G08B 5/38, 15/00

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	US 4241332 (FARQUE)	1,3,4,12 at least
X	WPI Abstract Accession No 78-H9523A/197841 & DE2836063 A (Maurer), 01.03.79	1 at least
X	WPI Abstract Accession No 84-159350/198426 & DE3246906 A (BBC), 20.06.84	1,17,20 at least
X	WPI Abstract Accession No 81-K7755D/198142 & DE2245231 A (Maurer), 08.01.81	1,10 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.